

PATENT ABSTRACTS OF JAPAN

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(54) IMAGE DETECTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain an image detector with an information processing function capable of selectively reading the processing and calculating result of picked-up image image-pickup data and previously retained image data.

SOLUTION: A sensor cell 1 selectively reads an arithmetic result at an arithmetic circuit image-pickup data retained in an image detecting sensor 31 and image data retained in a memory cell 32a data input/output circuit 4 reads and writes data from outside in the cell 32 inside of a sensor memory array 10 an address setting circuit 2 designates the row/column of the cell 32 inside of the array 10 and a control circuit 3 sets the range of the plural column outputting signals of the array 10.

CLAIMS

[Claim(s)]

[Claim 1] A photo-diode which accumulates an electric charge which absorbed irradiated light and was generated A picture detection sensor which saves imaging data of a size according to quantity of stored charge of this photo-diode An operation value at the time of performing image processing picturized beforehand such as an image data value and

pattern matchingAnd a memory cell which saves an operation value which performs data processing to an accumulation value of the above-mentioned photo-diodeAnd an arithmetic circuit which performs data processing by considering an accumulation value and an operation value of the above-mentioned photo-diode as an inputA sensor cell constituted by selection circuitry which reads selectively the result of an operation in this arithmetic circuitimaging data saved in a described image detection sensorand image data saved at the above-mentioned memory cellA sensor memory array which has arranged this sensor cell in the shape of two dimensionsand connected an output signal line of each sensor cell in common for every sequenceA data output circuit which write data from the outside to the above-mentioned memory cell inside the above-mentioned sensor memory arrayA picture sensing device which comprises an address selection circuit which specifies a line and a sequence of the above-mentioned memory cell inside the above-mentioned sensor memory array from the outsideand a control circuit which sets up and outputs the range of two or more sequence output signals of the above-mentioned sensor memory array.

[Claim 2]The picture sensing device according to claim 1 comprising an analog-to-digital converter which changes into digital one an operation value outputted from a sensor memory arrayand an image storage memory which saves an output of this analog-to-digital converter.

[Claim 3]The picture sensing device according to claim 1wherein a memory cell comprises an MOS type transfer gate to which a value of a capacitor holding an operation value and this capacitor is transmitted.

[Claim 4]The picture sensing device according to claim 3 refreshing a capacitor of a memory cell provided in a sensor memory array.

[Claim 5]The picture sensing device according to claim 3 choosing the one above-mentioned memory cell from a photo-diode with a switching signal from [out of a memory cell provided mostly] the outside.

[Claim 6]The picture sensing device according to claim 1wherein a memory cell comprises an analog flip-flop.

[Claim 7]The picture sensing device according to claim 1wherein a memory cell comprises a nonvolatile memory cell.

[Claim 8]The picture sensing device according to claim 1wherein a control circuit comprises an input output means which reads a value amplified with a sense amplifier which amplifies an analog sequence output signal of a sensor memory arrayand this sense amplifierand is outputted to a terminal.

[Claim 9]The picture sensing device according to claim 8wherein a sense amplifier provides a sense amplifier column decoder circuit which sets

voltage which equalizes a sequence output signal as two or more potential.

[Claim 10]The picture sensing device comprising according to claim 1:
A photo-diode which accumulates an electric charge which a sensor cell absorbed irradiated light and was generated.

A capacitor holding an operation value.

A transfer gate which writes data in the above-mentioned capacitor from an output signal line.

A transfer gate which reads data saved at the above-mentioned capacitor to the above-mentioned output signal line.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to processing of the picturized imaging data the result of an operation and the picture sensing device with an information processing function that can read selectively the image data saved beforehand.

[0002]

[Description of the Prior Art]Drawing 10 is a lineblock diagram showing the outline of the picture sensing device using the conventional charge coupled device (CCD) shown for example in Yuji Kiuchi work "foundation of an image sensor and application."

The pixel from which 50 detects light in a figure the photo-diode which 51 changes light into an electric charge and is accumulated The transfer gate where 52 leads the accumulated electric charge to vertical CCD53 and level CCD54 The amplifier which 55 transforms an electric charge into a voltage signal and is outputted from the read-out terminal 59 and 56 are scanners which lead the scanning pulse outputted from the control circuit 57 via the control terminal 58 one by one to vertical CCD53 and level CCD54.

[0003]Next operation is explained. First an inputted image is irradiated by the array of this pixel 50 and the photo-diode 51 of each pixel 50 changes light into an electric charge and accumulates it. This stored charge corresponds to the pixel signal of a picture. And this accumulated electric charge is led to vertical CCD53 via the transfer gate 52 synchronizing with the scanning pulse outputted from the control

circuit 57 via the control terminal 58 and the electric charge is transmitted to the bottom in order. And the electric charge which reached to the bottom of vertical CCD 53 is sent to level CCD 54. In level CCD 54 it is transmitted to a transverse direction in order and finally changes into a voltage signal with the amplifier 55 and outputs from the read-out terminal 59. Thus each pixel signal will be detected by a time series. [0004] In [drawing 11 is a lineblock diagram showing the conventional picture sensing device which performs image processing using a charge coupled device (CCD) and] a figure The analog-to-digital converter from which 60 changes into a digital signal the voltage signal of a sensor and the pixel to which 61 was outputted from the array of the sensor 60. As for the image data conversion circuit which carries out the data compression of the digital signal from which 62 was changed by the analog-to-digital converter 61, the image storage memory which saves the digital signal with which the data compression of 63 was carried out by the image data conversion circuit 62 and 65, an arithmetic circuit and 64 are data buses.

[0005] Next operation is explained. If light is irradiated by the pixel it will be generated by the optical generation carrier and will be accumulated in the inside of a pixel. The voltage signal of the pixel outputted from the array of the sensors 60 such as CCD is changed into a digital signal with the analog-to-digital converter 61 and is inputted into the image data conversion circuit 62. And the data compression of this changed digital signal is carried out by the image data conversion circuit 62 and it is once saved at the image storage memory 63. Next the image data beforehand saved in the image storage memory 63 and the data of the compressed digital signal are inputted into the arithmetic circuit 65 via the data bus 64. For example the operation etc. which search for the difference for detecting change data are performed and the result of an operation is saved at the image storage memory 63.

[0006] In this picture sensing device since it becomes a vast quantity of data for saving the picturized image data directly at the image storage memory 63, the processing curtailed by the image data conversion circuit 62 is needed. For example in a JPEG system processing which compresses 2M bit data into 1/10 and saves it is performed. The saved area of the compressed imaging data and the saved area of the arithmetic image data which performs an operation are needed and the speed of data processing is decided by the image storage memory 63 with the processing speed of the arithmetic circuit 65 and the data transfer rate of the data bus 64. [0007]

[Problem(s) to be Solved by the Invention] Since the conventional picture

sensing device was constituted as mentioned above the technical problem of being unable to read selectively processing of the picturized imaging data the result of an operation and the image data saved beforehand occurred.

[0008] It was made in order that this invention might solve the above technical problems and it aims at obtaining processing of the picturized imaging data the result of an operation and the picture sensing device with an information processing function that can read selectively the image data saved beforehand.

[0009] The purpose of this invention is as follows.

The memory quantity of image data with required providing outside is reducible.

Obtain the picture sensing device with an information processing function whose improvement in the speed processing of the picturized image data becomes possible in real time and is attained.

[0010] The purpose of this invention is as follows.

Attain low power consumption by small-size width and perform high-speed data transfer.

When you perform two or more kinds of image processing obtain the picture sensing device with an information processing function it becomes unnecessary image pick-up processing of multiple times.

[0011]

[Means for Solving the Problem] A photo-diode which accumulates an electric charge which a picture sensing device concerning this invention absorbed irradiated light and was generated A picture detection sensor which saves imaging data of a size according to quantity of stored charge of this photo-diode An operation value at the time of performing image processing picturized beforehand such as an image data value and pattern matching And a memory cell which saves an operation value which performs data processing to an accumulation value of a photo-diode And an arithmetic circuit which performs data processing by considering an accumulation value and an operation value of a photo-diode as an input A sensor cell constituted by selection circuitry which reads selectively the result of an operation in this arithmetic circuit imaging data saved in a picture detection sensor and image data saved at a memory cell Arrange a sensor cell in the shape of two dimensions by a sensor memory array and an output signal line of each sensor cell is connected in common for every sequence Data from the outside is written to a memory cell inside a sensor memory array by a data output circuit A line and a

sequence of a memory cell inside a sensor memory array are specified from the outside by an address selection circuit the range of two or more sequence output signals of a sensor memory array is set up by a control circuit and it is made to output.

[0012] A picture sensing device concerning this invention comprises an analog-to-digital converter which changes into digital one an operation value outputted from a sensor memory array and an image storage memory which saves an output of this analog-to-digital converter.

[0013] A picture sensing device concerning this invention comprises an MOS type transfer gate to which a value of a capacitor with which a memory cell holds an operation value and this capacitor is transmitted.

[0014] A picture sensing device concerning this invention is refreshed for a capacitor of a memory cell provided in a sensor memory array.

[0015] A picture sensing device concerning this invention chooses one memory cell from a photo-diode with a switching signal from [out of a memory cell provided mostly] the outside.

[0016] As for a picture sensing device concerning this invention a memory cell comprises an analog flip-flop.

[0017] As for a picture sensing device concerning this invention a memory cell comprises a nonvolatile memory cell.

[0018] In a control circuit a picture sensing device concerning this invention comprises an input output means which reads a value amplified with a sense amplifier which amplifies an analog sequence output signal of a sensor memory array and this sense amplifier is outputted to a terminal.

[0019] A picture sensing device concerning this invention provides a sense amplifier column decoder circuit which sets voltage on which a sense amplifier equalizes a sequence output signal as two or more potential.

[0020] A picture sensing device of this invention is characterized by comprising:

A photo-diode which accumulates an electric charge which a sensor cell absorbed irradiated light and was generated.

A capacitor holding an operation value.

A transfer gate which writes data in a capacitor from an output signal line.

A transfer gate which reads data saved at a capacitor to an output signal line.

[0021]

[Embodiment of the Invention] Hereafter one gestalt of implementation of

this invention is explained.

Embodiment 1. drawing 1 will be a lineblock diagram showing the sensor of the picture sensing device by this embodiment of the invention in a figure 1 is a sensor cell which comprises a pixel a memory cell and a computing unit array and if light is irradiated by the pixel it will be generated by the optical generation carrier and it will be accumulated in the inside of a pixel. A pixel comprises the same photo-diode 51 transfer gate 52 etc. as drawing 10. The address selection circuit where 2 specifies the line and sequence of the memory cell 32 of sensor cell 1 inside from the outside It is a sensor memory array in which the data output circuit where reading and 3 write a control circuit to the memory cell 32 of sensor cell 1 inside and reading and 4 write the data from the outside to it and 5 contain an address input terminal in and 6 includes the composition of the above [a control terminal and 7 / a data input/output terminal and 10].

[0022] In drawing 2 is a lineblock diagram showing the concrete composition of the sensor memory array of the picture sensing device by this embodiment of the invention in a figure The memory cell where the operation value at the time of 31 performing image processings such as a picture detection sensor an image data value pattern matching with which 32 was pictured before hand is saved The arithmetic circuit which 33 considers the value of the picture detection sensor 31 and the memory cell 32 as an input and performs data processing the selection circuitry as which 34 chooses the contents of the picture detection sensor 31 and the memory cell 32 and the output of the arithmetic circuit 33 and 35 are the column signal lines of sensor cell 1 inside.

[0023] Drawing 3 is a lineblock diagram for which the system of the picture sensing device by this embodiment of the invention 1 is shown and as for 11 an image storage memory and 12 are data buses an analog-to-digital converter and 13 in a figure. The operation value outputted from the sensor memory array 10 is changed into a digital value with the analog-to-digital converter 11. This changed data is the data in which data processing was already performed by the sensor memory array 10. In image-processing application of pattern matching etc. the data after an operation may turn into only difference data and may be able to do data volume saved at the image storage memory 13 few. Since the data volume stored in the image storage memory 13 also becomes only preservation of the result of an operation the equipment configuration which omitted data compression processing is possible. Therefore the output of the analog-to-digital converter 11 becomes realizable [the system configuration saved via the data bus 12 at the image storage

memory 13]. Writing or read-out is beforehand performed to the sensor cell 1 of sensor cell 1 inside to be set up via the data bus 12 from the image storage memory 13.

[0024]Drawing 4 is a lineblock diagram showing the appearance of the pixel of the picture sensing device by this embodiment of the invention 1. Stored charge will be reset by the initial state if the high (H) pulse is inputted into the C terminal 92. After accumulating an electric charge if the horn terminal 90 is set to Hit can read from the lout terminal 94 as the output current lout. On the other hand if the indicator lamp terminal 91 is set to Hit can read as output current-lout. Input light power is set to Wijand when sensitivity set up with the input voltage of the horn terminal 90 and the indicator lamp terminal 91 is set to Si the output current value outputted from the lout terminal 94 is expressed with $lout = Si \cdot Wij$.

[0025]Drawing 5 is a lineblock diagram showing the inside of a pixel of the picture sensing device by this embodiment of the invention 1. In the sense amplifier 70 which amplifies the analog sequence output signal of a sensor memory array if the transistor 81 is made one inner electric potential will be reset by the VDD level. And after returning the transistor 81 at OFF when it irradiates with light inner electric potential will fall according to the quantity. If the transistor 74 is set to H in this state positive output current will flow. The size of current is the maximum at the time of no glaring and the size of current is an inverted output which becomes small so that an exposure increases. On the other hand if the transistor 75 is set to H negative output current will flow. And the value amplified with this sense amplifier 70 is read with the transistor (input output means) 76 and is outputted to a terminal.

[0026] Next operation is explained. Drawing 6 is a lineblock diagram showing the calculating means which performs the memory cell of the picture sensing device by this embodiment of the invention 1 and the operation of picture element data. In the picture sensing device by this embodiment of the invention 1 the transfer gate 111 + capacitor 105 used with dynamic memory is used as a calculating means which performs the operation of a memory cell and picture element data. First in performing the operation same as an image sensor as the conventional sensor the output of the picture detection sensor 31 is chosen in the selection circuitry 34 and it outputs to the column signal line 35. Next the control terminal 112 is set to H the transfer gate 111 is made one and DRAM cell 102 is used in the state of non selection.

[0027] In operating as a memory the word line 101 is set to H the transfer

gate 104 is made one from the column signal line 103 and it saves the value of the column signal line 103 at a capacitor. On the other hand at the time of writing the potential of the column signal line 103 is written in the capacitor 105 and the electric charge saved at the capacitor 105 at the time of read-out is read to the column signal line 103.

[0028] In performing image processing within the sensor cell 1 the value of the picture detection sensor 31 and the memory cell 32 is inputted into the arithmetic circuit 33 data processing for absolute value differences such as difference etc. is performed and it outputs to the column signal line 35. The result of an operation outputted to the column signal line 35 is amplified and outputted in the data output circuit 4. Next DRAM cell 102 is chosen and an operation value is written in from the outside. Next where photoelectrical load accumulation of the pixel 110 is fully performed after making the transfer gate 111 one DRAM cell 102 is chosen and the result of an operation is saved at a capacitor. Then DRAM cell 102 is chosen again and the result of an operation is outputted to the column signal line 103. If a photoelectrical load and an operation value constitute to like-pole nature addition can be performed and subtraction can be performed if reverse polarity is used.

[0029] As mentioned above according to this Embodiment 1 the effect of being able to read selectively processing of the picturized imaging data the result of an operation and the image data saved beforehand is acquired. For example by processing of pattern matching etc. since it becomes easy to incorporate template data in the sensor memory array 10 the transmission processing from the outside of repeated template data becomes unnecessary and the effect of being integrated highly is acquired.

[0030] When outputting only an arithmetic processing result in the processing which outputs difference data the signal level read from each sequence turns into a level of a difference low power consumption can be attained by small-size width and effects like data transfer becomes possible at still high speed are acquired. Since the imaging data picturized within the sensor memory array 10 can save as an original image when performing two or more kinds of image processing effects like image pick-up processing of multiple times becomes unnecessary are acquired. It becomes possible to output an original image and the data after image processing and the effect of being able to output two or more image processing data to one original image is acquired.

[0031] embodiment 2. drawing 7 -- this embodiment of the invention -- since a portion [considerable / 2 / are a line block diagram showing the

sensor of the picture sensing device to twist and a lineblock diagram showing the pixel detection sensor in the picture sensing device according / drawing 8 / to this embodiment of the invention 2 and the same about the same numerals as Embodiment 1 or] is shown explanation is omitted. Although reading and the data output circuit 4 were writing the data from the outside to the memory cell 32 in response to directions of the control circuit 3 in Embodiment 1 In this Embodiment 2 the function which sets up and outputs the range of two or more sequence output signals of the sensor cell 1 is performed in the sense amplifier column decoder circuit 25 and the data output circuit 4 which are used by DRAM. [0032] The current value outputted from the column signal line of the sensor cell 1 is an analog value and in order to amplify and output the sense amplifier which has a function which amplifies an analog value is required for it. It is possible to read a very small analog value by providing the potential generating circuit which sets the voltage which equalizes a column signal line as two or more potential etc. [0033] As mentioned above according to this Embodiment 2 the effect of being able to output the value amplified by the column signal line 103 by composition which writes in the analog data of the picture detection sensor 31 and is amplified with the amplifier 115 and the read-out amplifier 116 is acquired.

[0034] embodiment 3. drawing 9 -- this embodiment of the invention -- since a portion [considerable / 3 / are a circuit diagram showing the memory cell using an analog type flip-flop in the picture sensing device to twist and the same about the same numerals as Embodiment 1 or] is shown explanation is omitted. Although the memory cell 32 in Embodiment 1 is the one transfer gate 104 111+ capacitor 105 used with dynamic memory The writing part which writes the data inputted via the transfer gate 104 111 the capacitor 105 and the output signal line as drawing 9 showed the memory cell 32 in this Embodiment 3 in the capacitor 105 And it comprises a read section which reads the data saved at the capacitor 105 to an output signal line.

[0035] As mentioned above according to this Embodiment 3 when performing image processing it is effective in the ability to save an operation value.

[0036]

[Effect of the Invention] As mentioned above the photo-diode which accumulates the electric charge which according to this invention absorbed the irradiated light and was generated The picture detection sensor which saves the imaging data of a size according to the quantity of the stored charge of this photo-diode The operation value at the time

of performing image processing picturized beforehand such as an image data value and pattern matching. And the memory cell which saves the operation value which performs data processing to the accumulation value of a photo-diode. And the arithmetic circuit which performs data processing by considering the accumulation value and operation value of a photo-diode as an input. The sensor cell constituted by the selection circuitry which reads selectively the result of an operation in this arithmetic circuit. The imaging data saved in the picture detection sensor and the image data saved at the memory cell. Arrange a sensor cell in the shape of two dimensions by a sensor memory array and the output signal line of each sensor cell is connected in common for every sequence. Data is written from the exterior to the memory cell inside a sensor memory array by a data output circuit. Since it constituted so that the line and sequence of a memory cell inside a sensor memory array might be specified from the outside by an address selection circuit, the range of two or more sequence output signals of a sensor memory array might be set up by a control circuit and it might output. There is an effect which can read selectively the image data held by the result of an operation, imaging data and a memory.

[0037] According to this invention, since it constituted from an analog-to-digital converter which changes into digital one the operation value outputted from the sensor memory array and an image storage memory which saves the output of this analog-to-digital converter, there is an effect which can lessen data volume saved at an image storage memory.

[0038] According to this invention, since the memory cell was constituted from an MOS type transfer gate to which the value of the capacitor holding an operation value and this capacitor is transmitted, there is an effect which can make a high integration memory cell possible.

[0039] According to this invention, since it constituted so that the capacitor of the memory cell provided in the sensor memory array might be refreshed, there is an effect which can make refresh operation within an array possible.

[0040] According to this invention, since it constituted so that one memory cell might be chosen from a photo-diode with the switching signal from [out of the memory cell provided mostly] the outside, there is an effect which can enable exchange of a defective cell.

[0041] Since the memory cell was constituted from an analog flip-flop according to this invention -- low -- there is an effect which can make a memory cell [****] possible.

[0042] Since the memory cell was constituted from a nonvolatile memory cell according to this invention, even when he has no powering on, there is

an effect which can enable maintenance of data.

[0043]According to this invention since the control circuit was constituted from an input output means which reads the value amplified with the sense amplifier which amplifies the analog sequence output signal of a sensor memory array and this sense amplifier and is outputted to a terminal there is an effect which can amplify an analog output.

[0044]According to this invention since the sense amplifier was constituted so that the voltage which equalizes a sequence output signal by a sense amplifier column decoder circuit might be set as two or more potential there is an effect which can amplify an analog output.

[0045]The photo-diode which accumulates the electric charge which according to this invention the sensor cell absorbed the irradiated light and was generated since it constituted so that the data saved by the capacitor holding an operation value the transfer gate which writes data in a capacitor from an output signal line and the transfer gate at the capacitor might be read to an output signal line It is effective in the ability to save an operation value when performing image processing.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a lineblock diagram showing the sensor of the picture sensing device by this embodiment of the invention 1.

[Drawing 2] It is a lineblock diagram showing the concrete composition of the sensor memory array of the picture sensing device by this embodiment of the invention 1.

[Drawing 3] It is a lineblock diagram showing the system of the picture sensing device by this embodiment of the invention 1.

[Drawing 4] It is a lineblock diagram showing the appearance of the pixel of the picture sensing device by this embodiment of the invention 1.

[Drawing 5] It is a lineblock diagram showing the inside of a pixel of the picture sensing device by this embodiment of the invention 1.

[Drawing 6] It is a lineblock diagram showing the calculating means which performs the memory cell of the picture sensing device by this embodiment of the invention 1 and the operation of picture element data.

[Drawing 7] It is a lineblock diagram showing the sensor of the picture sensing device by this embodiment of the invention 2.

[Drawing 8] It is a lineblock diagram showing the pixel detection sensor in the picture sensing device by this embodiment of the invention 2.

[Drawing 9] It is a circuit diagram showing the memory cell using an

analog type flip-flop in the picture sensing device by this embodiment of the invention 3.

[Drawing 10] It is a lineblock diagram showing the outline of the conventional picture sensing device.

[Drawing 11] It is a lineblock diagram showing the conventional picture sensing device.

[Description of Notations]

1 A sensor cell 2 address selection circuits and 3 A control circuit 4 data output circuits 10 A sensor memory array 11 analog-to-digital converters 13 image storage memories 25 A sense amplifier column decoder circuit and 31 [A photo-diode and 70 / A sense amplifier and 76 / A transistor (input output means) 104 111 transfer gates and 105 / Capacitor.] A picture detection sensor and 32 A memory cell and 33 An arithmetic circuit 34 selection circuitries and 51
